

REMARKS

In the Final Office Action dated January 25, 2007 the Examiner rejected claims 1-3, 5-12, 14-20 and 22-24 under rejected under 35 USC 102(b) as anticipated by Sugama (US Patent Publication 2002/0118907) and claims 4, 13 and 21 were rejected as obvious over Sugama and Nakamura (US Patent 5,604,835). In response thereto, the Applicant has amended claims 1, 3, 8, 12, 18, 20 and 23. Claims 1-24 remain at issue.

THE ART REJECTION

The Applicant has amended claims 1 and 18 to include a top cladding layer that is *patterned* so that the a *substantial portion of a plurality of optical lenses* formed on the bottom cladding layer and positioned in the optical path of the ends of the plurality of the core channels *are exposed to ambient air respectively*.

The Applicant has carefully reviewed Sugama. None of the many embodiments of the reference teach or suggest the patterning of a top cladding layer so that a substantial portion of the optical lenses are exposed to ambient air.

The most relevant embodiment of Sugama appears to be illustrated in Figure 47. In this embodiment, a core 86 is formed directly on a substrate 90. A top cladding layer 85 is then formed over the cladding layer. A tip portion 88 of the core 86 is exposed to ambient air and surrounded by the top cladding layer 85. See paragraphs [0303] through [0307] of Sugama.

This embodiment of Sugama differs from the present invention as claims in at least two regards: (i) the top cladding layer 85 of Sugama is not *patterned*. As is clearly evident in the Figure, the top cladding layer is a uniform layer formed over the substrate 90. It is not patterned in any manner; and (ii) only the “tip portion” of the core 88 is exposed to ambient air. In contrast with the present invention, a **at substantial portion of** the plurality of optical lenses are exposed to ambient air

Claims 12-17 of the present invention are directed to a core channel having a curved section which follows a curved path and top cladding layer that is patterned to expose the curved section of the underlying core to ambient air. A review of the Sugama reference indicates that none of the embodiments teach or suggest a core channel having a curved section that is exposed to ambient air through a patterned top cladding layer.

In formulating the rejection, the Examiner states that the waveguide system of Figures 14 through 16 includes a bottom cladding layer 21, a core channel 23 having a curved section, and a top cladding layer 27 patterned to include a curved opening 16 so the underlying curved section of core channel 23 is exposed to ambient air. A review of the Sugama reference with regard to Figures 14-16 indicates that the Examiner has completely misconstrued the actual teaching of the reference. The cores 23 of Sugama: are (i) not curved; and (ii) not covered or exposed to ambient air.

In paragraph [0173] Sugama states that a description of Figure 14 is omitted because it is the same as Figure 13. A detailed discussion of Figure 13 is therefore provided below.

With reference to Figure 13 in paragraph [0170], Sugama describes an optical wiring multi-layer substrate with input optical wires 12 formed in a *lower* layer and output optical wires formed in an *upper* layer. In Paragraph [0171], Sugama further teaches that the input wiring 12 and the output wiring 13 are “*linear*” (i.e., not curved) and are “*orthogonal to each other on different layers*”. In paragraph [0174], Sugama teaches that an interlayer optical via hole 16 is provided between the input wiring 12 and the output wiring 13 to optically couple the two together.

FIG. 13

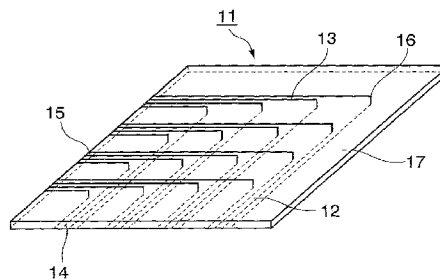
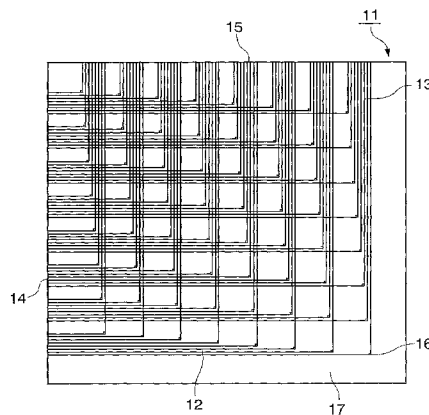


FIG. 14



Therefore, as clearly described and illustrated in Sugama, the optical wires 12 and 13 (i.e., cores) are linear and orthogonal to one another on different layers of the substrate. The optical wires 12 and 13 are **not** curved. Rather, an inter-layer optical via hole 16 is provided so the orthogonal input and output wires are in optical communication with each other.

The interlayer optical via hole 16 is illustrated in Figures 15 and 16A-16H of Sugama. Figure 15 is described by Sugama in paragraphs [0175] through [0177]. In paragraph [0175], Figure 15 is described as a cross-sectional view of an upper waveguide and a lower waveguide. The two waveguides are “orthogonal” (i.e., at right angles or 90 degrees apart) from one another.

In paragraph [0176], both the upper and lower waveguides are each described as composed of three layers, including an under-cladding 22, a core 23, and an over-cladding 24, both formed on a substrate 21.

In paragraph [0177], Sugama describes the optical hole 16 as comprising the grooves 20 each covered with a reflective metal film 25.

Figure 15, provided below, clearly shows the upper and lower waveguides optically connected by the optical hole 16. The upper and lower waveguides are not curved. Rather the upper and lower waveguides are (i) on different levels with respect to one another; (ii) are linear and orthogonal with respect to one another; and (iii) communicated with one another via the optical hole 16.

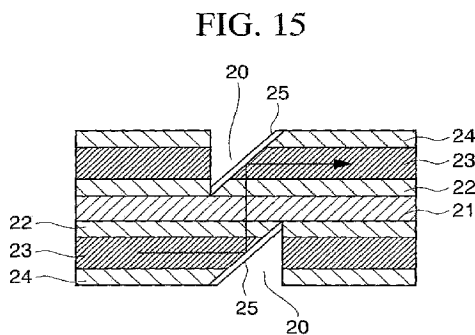


Figure 15 specifically shows the path of light through the Sugama waveguide. The arrow (no reference number is provided) clearly shows the light path as follows:

- (i) from the core 23 of the lower waveguide and reflecting upward off the mirrored surface 25 of the bottom groove 20;
- (ii) through the substrate 21; and

(iii) off the upper reflective surface 25 and into the upper core 23 of the top waveguide.

The waveguide structure of Figure 15 therefore clearly teaches that the optical vias 16 are defined by the reflective surfaces 25 of the upper and lower grooves 20.

Accordingly, in no way does Sugama teach that the cores 23 are: (i) curved. On the contrary, Sugama explicitly teaches that the upper and lower cores 23 (i.e., input wires 12 and output wires 13) are *linear*; or (ii) exposed to ambient air. Sugama specifically teaches that the optical vias 16 are in the optical path between the upper and lower waveguides and are defined by the reflective surfaces 25 of the upper and lower waveguides respectively. Sugama therefore fails to teach or suggest the present invention as claimed in the present application.

Applicant believes that all pending claims have been amended and the case is now in a condition for allowance. The Applicant respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,
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